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FORM PTO-1390 (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 4125/PCT

US APPLICATION NO (If known, see 37 CFR 1.5): (not known - 09/830625 assigned)

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/03438	28.October, 1999 (28.10.99)	28.October,1998 (28.10.98)

TITLE OF INVENTION
INSULATING ARRANGEMENT FOR THE INNER INSULATION OF AN AIRCRAFT

APPLICANT(S) FOR DO/EO/US
Gerhard SCHMITZ; Matthias WITSCHKE; Rainer MUELLER; PetraTRANSKI; Heiko LUETJENS

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1)
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau). corresponds to publication WO 00/24632
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)). with Translator's Declaration.
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired
   d. [X] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)), with Translator's Declaration.
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [X] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). : Claim 1 amended under PCT Art. 34 on 11. August/2000 WITH TRANSLATOR'S DECLARATION

Items 11. to 16. below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449, copy of Search Report and translation thereof.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment. to minimize the filing fee,
    [X] A SECOND or SUBSEQUENT preliminary amendment, With Marked-Up Version of amended claim 1
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:
    a. a return receipt postcard;
    b. 3 Figs. on 1 sheet of drawings;
    c. Form PTO-2038 (Credit Card Payment Form) to cover the filing fee.
    d. copy of International Preliminary Examination Report

NOTE: The priority of German Patent Application No. 198 49 696.6, filed in the Federal Republic of Germany, is claimed under 35 U.S.C. §119. on October 28, 1998

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US APPLICATION NO (if known, see 37 CFR 1.5) (not known to be identified)	INTERNATIONAL APPLICATION NO PCT/DE99/03438	ATTORNEY'S DOCKET NUMBER 4125/PCT

17 ☒ The followine fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... ~~$970.00~~		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... ~~$840.00~~	$860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... ~~$710.00~~		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... ~~$690.00~~		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... ~~$96.00~~		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
total claims	- 20 =		X $18.00	$ 0	
Independent claims	- 3 =		X $78.00	$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $260.00	$ 0	
TOTAL OF ABOVE CALCULATIONS =				$ 0	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				$860.00	
SUBTOTAL =				$860.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ 0	
TOTAL NATIONAL FEE =				$860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 0	
TOTAL FEES ENCLOSED =				$860.00	
				Amount to be: refunded	$
				charged	$

a. ☒ Form PTO-2038 (credit card payment form) ~~a check~~ in the amount of $860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 50-0507. ~~XXXXXXXXXXXXXXXXXXXXXXXX~~ or any fee deficiency

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

CUSTOMER NO.: 021553

Walter F. Fasse
SIGNATURE

April 27, 2001

Walter F. Fasse
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Reg. No.: 36132
REGISTRATION NUMBER

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DOCKET NO.: 4125/PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
IN THE MATTER OF THE NEW PCT NATIONAL PHASE PATENT APPLICATION
OF: Gerhard SCHMITZ et al.
FILED: April 27, 2001
SERIAL NO.: to be assigned
PCT INTERNATIONAL APPLICATION: PCT/DE99/03438
PCT INTERNATIONAL APPLICATION FILED: OCTOBER 28, 1999
FOR: INSULATING ARRANGEMENT FOR THE INNER INSULATION OF AN AIRCRAFT

COMMISSIONER FOR PATENTS
BOX NEW PCT
WASHINGTON, D. C. 20231

April 27, 2001

FIRST PRELIMINARY AMENDMENT TO MINIMIZE THE FILING FEE

Dear Sir:

In order to minimize the filing fee, please amend the above identified patent application as follows before calculating the filing fee.

In the Claims: (Referring to the Literal Translation)

Please cancel claims **6 to 12**.
Claims **1 to 5** are maintained for calculating the filing fee.

REMARKS:

After calculating the filing fee, please further enter the accompanying Second Preliminary Amendment which adds new claims **13** to **19** for examination.

Respectfully submitted,
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WFF:ar/4125/PCT
Encls.: postcard

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DOCKET NO.: 4125/PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE MATTER OF THE NEW PCT NATIONAL PHASE PATENT APPLICATION

OF: Gerhard SCHMITZ et al.

FILED: April 27, 2001

SERIAL NO.: to be assigned

PCT INTERNATIONAL APPLICATION: PCT/DE99/03438

PCT INTERNATIONAL APPLICATION FILED: OCTOBER 28, 1999

FOR: INSULATING ARRANGEMENT FOR THE INNER INSULATION OF AN AIRCRAFT

COMMISSIONER FOR PATENTS
BOX NEW PCT
WASHINGTON, D. C. 20231

April 27, 2001

SECOND PRELIMINARY AMENDMENT

Dear Sir:

After calculating the filing fee and granting a filing date, but before the first examination, please amend the above identified application as follows.

In the Claims:

1. (amended) Insulation arrangement for the inner insulation of an air vehicle, consisting of an insulation packet (1) that is encased by a film (5) and insertable within an interspace (7), which is enclosed by an inner trim component (12) and an outer skin (6) of the air vehicle, characterized in that the insulation packet (1), which is completely surrounded by the film (5), does not completely line the interspace (7) in the inserted condition,

and the film (5), which is realized with a film material that permits the diffusion of gases, is incorporated as the outer skin of an inner insulation with a differing diffusion resistance from the film outer to the film inner wall surface or in the opposite direction depending on the diffusion direction.

Claims **2 to 5** are maintained unchanged.

Claims **6** to **12** have been previously cancelled by applicant's First Preliminary Amendment.

Please enter new claims **13** to **19** as follows.

13. Insulation arrangement according to the claim 1, characterized in that the film (5) or (2) lies on a stringer (8), which divides the interspace into an inner region (7) and an air gap region (10), whereby an air gap (s) is provided between the stringer (8) and the outer skin (6).

14. Insulation arrangement according to claim 13, characterized in that plural spacer members, with which the stringer (8) is supported relative to the outer skin (6), are arranged within the air gap (s).

15. Insulation arrangement according to the claim 2, characterized in that the inner trim component (12) is

provided with plural slits and/or openings, which are provided for the penetration of a relatively warm air (9) that is located outside of the inner space (7) and that is loaded with a high moisture, to the film outer surface of the film (5) or (3), which faces toward the inner trim component (12).

16. Insulation arrangement according to the claim 13, characterized in that the film outer surface of the first film (2) is arranged predominantly lying on the stringer (8) and the film outer surface of the second film (3) is oriented predominantly to the surface of the inner trim component (12) facing toward the inner space (7).

17. Insulation arrangement according to the claim 1, characterized in that the insulation packet (1) is realized with an insulation material consisting of polyphenylene sulfide (PPS), which is encased by the film (2, 3, 5) embodied as a synthetic plastic film, of which the position in the inner space (7) is adapted to the surface contour of the outer skin (6).

18. Insulation arrangement according to the claim 3, characterized in that the first film (2) is of a thin film, and the second film (3) is a thick film.

19. Insulation arrangement according to claim 13, characterized in that, whereby the film (5) or (2) lying on the stringer is arranged not lying on the inner trim component (12), whereby an additional drying effect of the total arrangement is achieved by a conditioned air (11) flowing through the inner space (11) from an air conditioning device.

REMARKS:

Before the first examination, please enter the above voluntary amendment. No new matter is introduced by the present amendment.

Amended claim 1 corresponds to the revised claim 1 that had been submitted to the International Preliminary Examining Authority on August 11, 2000 under PCT Article 34, and that is the basis of the International Preliminary Examination Report. Please see the accompanying marked-up version of original claim 1 showing the amendments, and the accompanying literal translation of revised PCT claim 1.

New claims 13 to 19 are based directly in sequence on the original literally translated claims 6 to 12 except for omitting the multiple dependencies.

In accordance with the PCT procedures, the specification and claims are a literal translation of the PCT International Application. Other informalities, if any, in the literally translated specification and claims will be corrected after issuance of the first Office Action.

2) Examination of the present application is to proceed on the basis of claims 1 to 5 and 13 to 19. The Internal Preliminary Examination Report finds that revised PCT claim 1 as well as dependent PCT claims 2 to 12 satisfy all criteria for patentability. Present claims 1 to 5 and 13 to 19 correspond to those patentable PCT claims. Favorable consideration and allowance of claims 1 to 5 and 13 to 19 are respectfully requested.

Respectfully submitted,

Gerhard SCHMITZ et al.
Applicant

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WFF:ar/4125/PCT
Encls.: postcard
marked-up version
of amended claim 1

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Docket # 912S/PCT
INV.: G Schmitz et al.
Filed: 04-27-01

U.S. National Phase of
PCT/DE99/03438

"Marked-Up Version" of Amended Claim 1

Patent Claims

1. (amended) Insulation arrangement for the inner insulation of an air vehicle, consisting of an insulation packet (1), which is encased by a film (5) and [arranged] (insertable) within an interspace (7) of the air vehicle, which is enclosed by an inner trim component (12) and an outer skin (6), characterized in that the insulation packet (1), which is completely surrounded by the film (5), does not completely line the interspace (7) in the inserted condition, and the film (5) is realized with a film material that [is permeable by] (which permits the diffusion of) gases, [with which a different] diffusion resistance [behavior is] achieved dependent [on the diffusion direction of the total arrangement]. (from the film outer to the film inner wall surface or in the opposite direction depending) is incorporated as the outer skin of an inner insulation with a differing

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DOCKET NO.: 4125/PCT

LITERAL TRANSLATION OF PCT INTERNATIONAL APPLICATION PCT/DE99/03438 FILED ON OCTOBER 28, 1999

INSULATING ARRANGEMENT FOR THE INNER INSULATION OF AN AIRCRAFT

The invention relates to an insulating arrangement for the inner insulation of an air vehicle according to the preamble of the claim 1.

It is known that the primary insulation located on the structure side for insulation systems presently used in aircraft construction essentially consists of an insulation base material and a film covering or encasing this insulation. The core material of the insulation system is protected against water entry with the conventionally utilized films. Moreover, the film covering or casing serves for the securing of the partially bulky or flossy insulation material. Generally, this casing or covering is dimensioned in such a manner so that it has lowest possible weight portions. In this context it can be determined, that due to the relatively thin film, upon the occurrence of water vapor diffusion through the film wall, the water vapor penetrates into the film-covered insulation packet. Thereby, the water vapor partially condenses out in the insulation packet. Moreover, diffused liquid particles (water) always repeatedly enter into the insulation packet through unsealed or leaky areas in the insulation packet or in the film covering. The condensation in the insulation packet leads to the result that a collecting of the liquid particles (of the water) occurs in the insulation

material, which may only be removed by additional drying efforts. This fact also has a very unpleasant effect, because the insulation system gains in weight due to the water accumulation(s) and thereby leads to an unnecessary increase of the weight of an aircraft.

As a result of the above, the invention is based on the object, to embody an insulation arrangement of the above mentioned type so that nearly no humid or moist air or other moist gas or water (vapor) particles will penetrate into a film-covered insulation packet, by means of suitable measures (and air guidances), while oppositely (in connection with an accumulation that has occurred in that manner), the accumulated moisture shall quickly escape without hindrance from the insulation packet.

This object is achieved by the measures defined in the claim 1. Advantageous embodiments of these measures are defined in the further claims.

The invention is described in greater detail in an example embodiment with reference to the accompanying drawings. It is shown by:

Fig. 3: the insulation arrangement according to Fig. 2 with the film covering consisting of a film.

In the Fig. 1, a conventionally utilized insulation arrangement for an aircraft is illustrated, which one installs in a known manner within an interspace (hollow space) which is bounded by

the inner region A and the structure region B of the aircraft. In practice, the interspace 7 is formed by the metal outer skin 6 (allocated to the structure region B) and an inner trim component 12, for example a plate-like cabin trim panel arranged at a spacing from the outer skin 6. In this context, the inner trim component 12 largely follows the curvature of the outer skin 6, whereby a vertical position of both means is selected in the Figs. 1 and 2. The inner trim component 12 is provided with machined-in slits or (other) holes or penetrations at certain locations, through which (generally) relatively warm (cabin) air 9, which comprises a relatively high moisture or humidity content, penetrates into the interspace. The actual insulation arrangement is made up of an insulation packet 1 and a conventional film covering (film 4) of synthetic plastic, which encases or covers the above mentioned bulky or flossy insulation material, or insulation material consisting of a foam, (of the insulation packet 1) for the purpose of securing the same. An air gap s is formed between the insulation packet and the outer skin 6.

In the conventionally utilized insulation arrangement of known insulation systems, films 4 are used, which largely prevent a liquid water entry (entry of water, moist or humid air or other moisture), yet are not (water) vapor tight due to their low density or tightness or due to the low diffusion resistance coefficient of the film covering. This circumstance has especially hindering effects on the film region or area directed toward the warmer cabin side of an aircraft. Since the forward penetration of the relatively warm air 9 (cabin air) through the

slits and cut-out notches of the inner trim component 12 (cabin trim paneling) continues to the surface of the film 4, moreover, the air 9 loaded with high air moisture or humidity can get into the insulation packet 1 through the film wall by an expected water vapor diffusion process. Since during the flight phase of the aircraft (predominantly in cruise flight) a strong cooling of the outer skin 6 to approximately -50°C (minus fifty degrees Celsius) will occur, it cannot be avoided, that the moisture contained in the water vapor (due to falling below the dew point) condenses out. The result will be a collecting or accumulating of moisture or ice in the insulation packet 1. During the landing and ground operation phase of the aircraft, the temperature of the outer skin 6 will increase. During this phase, the ice will correspondingly become water. The water, which is located in the insulation packet 1, will however only be able to leave or escape from the insulation packet 1 through larger (microporous) openings (not shown) in the film wall. It is, however, disadvantageous, that therefore the possibility also exists, that water will once again enter into the insulation packet 1 through these film openings. The release of water through the film wall in the form of water vapor is, however, only possible during a limited time, since (generally for reasons) the ground time of a commercial transport aircraft will be maintained relatively short, and the conventionally utilized film 4 (film covering) is not laid out for a more rapid release of water vapor out of the insulation packet 1. This diffusion process (as has been mentioned initially above) will lead to an undesired accumulation of condensate water in the known insulation packets 1 that are encased or covered with a conventional film 4. Additionally

effective disadvantages of the conventional insulation arrangement were also given initially above.

In the following, the example embodiments according to the Figures 2 and 3 will be described in greater detail. For the sake of a better understanding, the insulation arrangement according to Fig. 3 will first be considered in greater detail. An insulation structure or arrangement is contemplated, which is made up of an insulation packet 1 and a film 5, which completely encases or covers the insulation packet 1, according to the example of Fig. 1. The arrangement of this insulation structure or arrangement, which will similarly correspond to the arrangement according to Fig. 1, has been omitted from this figurative illustration. According to the two Figures 2 and 3, generally a film arrangement is contemplated, which is made up of (only) one single film 5 (encasing the insulation packet 1) or of two films 2, 3 (encasing the insulation packet 1) which are integrated into a single film 5 (intended according to the example of Fig. 3). Both film arrangements are generally realized with a film material that is permeable by gases, with which a different diffusion resistance characteristic or behavior is achieved dependent upon the diffusion direction of the total structure from the moist or damp inner space 7 to the cold outer skin 6.

With reference to the Fig. 3, the differential diffusion resistance characteristic of the film 5 is realized with a film material which provides a high diffusion resistance coefficient from the film outer wall surface to the film inner wall surface, and provides a low diffusion resistance coefficient in the opposite

diffusion direction (namely: from the film inner wall surface to the film outer wall surface). This film arrangement or structure (referring to the film 5) is worth consideration, for the fact that one may therewith enclose or cover (coat over) the outer surface area of the insulation packet 1 on all side areas with a single film 5 (encasing or covering film) of the same common material, from the point of view of a rational fabrication of the insulation arrangement. This film 5 will function in such a manner, whereby the diffusion resistance coefficient is large in a direction toward the internally located insulation packet 1 which is entirely covered or encased by the film 5. In other words, no water (vapor) can penetrate entirely to the insulation packet 1. The film 5 acts as a moisture blocker (as a vapor barrier). In the opposite direction, the film 5, however, has a different diffusion resistance coefficient, which is as small (low) as possible, so that in the given case, the accumulated water from the insulation packet 1 (from the inwardly located insulation) can easily diffuse out of the insulation packet 1 in the form of water vapor.

Returning to the Fig. 2, as mentioned, a film casing or covering is utilized, which is assembled or made up of two films 2, 3 of different types of materials. The two films 2, 3 are fixedly (and seamlessly) joined with each other along their film edges, so that one obtains a film casing or cover according to the example of the Fig. 3. Furthermore, it is a prerequisite, as already explained with regard to Fig. 1, that the insulation arrangement (according to the Fig.2), with the film casing or cover made up of a first and a second film 2, 3, is likewise

arranged within the mentioned interspace which is enclosed by the inner trim component 12 (cabin trim paneling) and the (metal) outer skin 6 of the aircraft.

Thereby the insulation packet 1, which is fully covered or encased by the film 5 (made up of the two films 2, 3), will not completely line the interspace. Thereby the insulation arrangement will always be surrounded by a (certain) hollow space, due to an intended (and below described) supply of conditioned air 11.

This film (casing) that is fused at the film edges (of two films 2, 3) completely encloses the insulation packet 1 and lies thereon in such a manner so that the film surface of a first film 2 predominantly is arranged lying on the stringer 8. The film surface of a second film 3 predominantly is positioned opposite the surface of the inner trim component 12 facing toward the inner space 7. Predominantly because certain edge regions or portions of the surface, that are limited to the section(s) of the fusion of both films 2, 3, are oriented in the direction of the lengthwise extension (the extended length) of the inner trim component 12 or of the stringer 8, and from there the above mentioned conditioned air 11 will also enter into the mentioned inner space 7.

Thereby the first film 2 will lie on the extended surface area of the stringer 8, thus in the selected example, not lying on the inner trim component 12. Since the second film 3 is located free in the inner region 7 (and not lying on the inner trim component

12), the second film 3 will be surrounded most extensively by the conditioned air 11 flowing through the inner region 7.

It is also mentioned at this point, that several spacer members are arranged between the outer skin 6 and the insulation packet 1, or between the stringer edge (of the stringer 8) and the insulation packet 1. Hereby an air gap s is formed.

The first film 2 is realized with a film material that achieves a low diffusion resistance coefficient in the diffusion direction of the gas diffusing through the film wall from the film inner wall surface to the film outer wall surface. The term gas is understood to mean, as mentioned previously, relatively warm air, which is loaded with high moisture or humidity, which flows through the slits and openings of the inner trim component 12 into the inner region 7.

The second film 3 is realized with a film material that achieves a high diffusion resistance coefficient in the diffusion direction of the gas diffusing through the film wall from the film outer wall surface to the film inner wall surface.

According to all embodiments of the described insulation arrangement, the film-encased insulation packet 1 is realized with an insulation material consisting of polyphenylene sulfide (short designation: "PPS"). The latter is covered or encased by the individual film 5 embodied as a synthetic plastic film (according to the Fig. 3) or by the film arrangement, which consists of two different types of films 2, 3 (according to the Fig. 2) which are

combined together to a single film 5. Thereby the film material(s) of the film 5 (which may be combined together of two different types of film materials in a given case) (according to the film structure according to the Figures 2 and 3) realizes (realize) a differential diffusion resistance coefficient, depending on the direction of the occurring diffusion through the film wall, as described previously. Their spatial arrangement within the inner region 7 (or the interspace) is adapted, at the location of their contact surface, to the surface contour of the surface of the stringer 8 (oriented toward the inner trim component 12) or (but also) to the surface contour of the inner surface of the outer skin 6.

In closing it is summarized that the different films 2, 3, 5 (film coverings or casings) according to the Figures 2 and 3 consist of different types of film materials, so that an accumulation of condensate water in the insulation packet 1 encased by the film is excluded. A second film 3 (according to the Fig. 2) facing toward the inner region A will comprise a film material that provides a high diffusion resistance coefficient in the diffusion direction of the medium [from the film outer to the film inner (wall) surface]. That has the advantage that the air that is loaded with a (relatively) high moisture or humidity, which flows in through slits and openings from the inner region A (for example from the passenger cabin of an aircraft) into the intermediate region (into the inner region 7), cannot diffuse directly into the primary insulation (arranged close to the aircraft fuselage structure). At the area of the insulation arrangement oriented toward the outer skin 6 (as a component of

the aircraft fuselage structure), a first film 2 (according to the Fig. 2) is utilized, which is open to diffusion and which comprises a low diffusion resistance coefficient in the diffusion direction of the medium from the film inner to the film outer (wall) surface.

This has the advantage, primarily during warm ground times (ground phase of an aircraft) that liquid water, which has accumulated by condensation in the insulation packet 1, can escape from the insulation packet 1 as water vapor in a (relatively) unhindered manner and therewith quickly. Thereby a drying of the insulation packet 1 is strived for. Thereby it is a prerequisite that a sufficient air gap s exists between the outer skin 6 and the first film 2. The stringer 8, on which lies the primary insulation, thereby functions as a spacer member relative to the outer skin 6. Additional holder elements will serve to maintain or to enlarge if necessary the air gap region 10 between the outer skin 6 and the insulation arrangement (the film-encased insulation packet 1). Thus, two essential effects in comparison to the conventionally utilized aircraft insulation are achieved:

a) the water vapor, which can come from the inner region A (originating from the passenger cabin) into the interspace (inner region 7), is prevented from penetrating (from diffusing) into the insulation packet 1 by the second film 3 functioning as a vapor barrier;

b) the liquid water, which nonetheless collects in the insulation packet 1, may, for example, leave the insulation packet 1 in the form of water vapor through the diffusionally open first film 2, during the warm ground phase of an

aircraft. Thereby a drying of the primary insulation is supported, and therewith the accumulation of condensate water in the insulation system is prevented.

Both embodiments of the presented insulation arrangement according to the Figures 2 and 3 possess the advantage that one achieves an additional drying effect even during flight (in the cruise flight of an aircraft) with conditioned air, which one additionally supplies to the affected insulation arrangement by means of an active air conditioning device (air conditioning apparatus). This is especially because the film construction according to the Fig. 3 will ensure that the insulation packet 1 can even dry out at all. Overall, the following advantages are achieved with the presented insulation constructions:

a) Less water vapor will enter into the insulation packet 1, so that also less condensation takes place in the insulation packet 1;

b) Condensate water, which has once collected in the insulation packet 1, can again escape from the insulation in the form of water vapor;

c) The insulation packet 1 can more easily be dried after all of the above;

d) There no longer arises an accumulation of condensate water in the insulation packet 1,

e) Because less water is present in the insulation, the operating life of the insulation arrangement or the insulation system is increased;

f) Corresponding weight is saved in the air vehicle (for example in the aircraft), whereby the flight capacity is increased;

g) The suggested measures may be realized without special effort. That applies also to retrofitting of air vehicles (aircraft) located in service;

h) If, nonetheless, the utilization of a drying system is provided in the air vehicle (in the aircraft), for drying the structure, then the described insulation arrangement according to the Figures 2 and 3 may be installed to be just as effective as necessary.

EP 0 440 704 B1

Patent Claims

1. Insulation arrangement for the inner insulation of an air vehicle, consisting of an insulation packet (1), which is encased by a film (5) and arranged within an interspace, which is enclosed by an inner trim component (12) and an outer skin (6), characterized in that the insulation packet (1), which is completely surrounded by the film (5), does not completely line the interspace, and the film (5) is realized with a film material that is permeable by gases, with which a different diffusion resistance behavior is achieved dependent on the diffusion direction of the total arrangement.

2. Insulation arrangement according to claim 1, characterized in that such a diffusion behavior is allocated to the film material of the film (5), whereby it provides a high diffusion resistance coefficient from the film outer to the film inner wall surface and in the opposite diffusion direction (from the film inner to the film outer wall surface) it provides a low diffusion resistance coefficient.

3. Insulation arrangement according to claim 1, characterized in that the film (5) is made up of at least two different type films (2, 3), which are fixedly joined with one another on the film edges, whereby the individual film (2, 3) lies section-wise on the insulation packet (1).

4. Insulation arrangement according to claim 3, characterized in that a first film (2) is realized with a film material, which provides a low diffusion resistance coefficient in the diffusion direction of the total arrangement on the side of the insulation packet (1) facing toward the outer skin (6).

5. Insulation arrangement according to claim 3, characterized in that a second film (3) is realized with a film material, which provides a high diffusion resistance coefficient in the diffusion direction of the total arrangement on the side of the insulation packet (1) facing toward the inner trim component (12).

6. Insulation arrangement according to the claims 1 to 3, characterized in that the film (5) or (2) lies on a stringer (8), which divides the interspace into an inner region (7) and an air gap region (10), whereby an air gap (s) is provided between the stringer (8) and the outer skin (6).

7. Insulation arrangement according to claim 6, characterized in that plural spacer members, with which the stringer (8) is supported relative to the outer skin (6), are arranged within the air gap (s).

8. Insulation arrangement according to the claims 2 and 3, characterized in that the inner trim component (12) is provided with plural slits and/or openings, which are pro-

vided for the penetration of a relatively warm air (9) that is located outside of the inner space (7) and that is loaded with a high moisture, to the film outer surface of the film (5) or (3), which faces toward the inner trim component (12).

9. Insulation arrangement according to the claims 3 to 6, characterized in that the film outer surface of the first film (2) is arranged predominantly lying on the stringer (8) and the film outer surface of the second film (3) is oriented predominantly to the surface of the inner trim component (12) facing toward the inner space (7).

10. Insulation arrangement according to the claims 1 to 3, characterized in that the insulation packet (1) is realized with an insulation material consisting of polyphenylene sulfide (PPS), which is encased by the film (2, 3, 5) embodied as a synthetic plastic film, of which the position in the inner space (7) is adapted to the surface contour of the outer skin (6).

11. Insulation arrangement according to the claims 3 to 5, characterized in that the first film (2) is of a thin film, and the second film (3) is a thick film.

12. Insulation arrangement according to claim 6, characterized in that, whereby the film (5) or (2) lying on the stringer is arranged not lying on the inner trim component (12), whereby an additional drying effect of the total arrange-

ment is achieved by a conditioned air (11) flowing through the inner space (11) from an air conditioning device.

EP 0 242 601 B1

ABSTRACT

Insulating Arrangement for the Inner Insulation of an Aircraft

The invention relates to an insulation arrangement for the inner insulation of an air vehicle according to the preamble of the claim 1.

By means of appropriate measures (and air guidances) there will be almost no humid air or other humid gas or water (vapor) particles that will penetrate into a film-encased insulation packet, whereby oppositely (in the case of an accumulation in this manner) the accumulated moisture will quickly and without hindrance escape from the insulation packet.

The insulation arrangement consisting of an insulation packet, which is encased by a film. The film is arranged in an interspace, which is enclosed by an inner trim component and an outer skin. The insulation packet, which is completely surrounded by the film, does not completely line the interspace. The film is realized with a film material that is permeable by gases, with which one achieves a differentiated diffusion resistance behavior dependent on the diffusion direction of the total arrangement.

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FILED: 04/27/01
09/830625

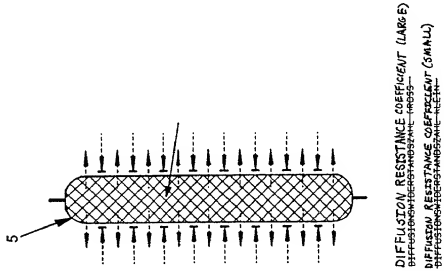

Fig. 3

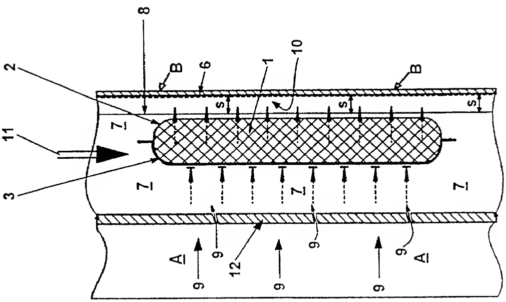

Fig. 2

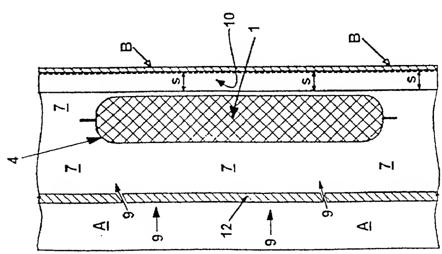

Fig. 1

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) WITH POWER OF ATTORNEY

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	4125
First Named Inventor	Gerhard Schmitz
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

INSULATING ARRANGEMENT FOR THE INNER INSULATION OF AN AIRCRAFT

(Title of the Invention)

the specification of which

☐ is attached hereto
OR
☐ was filed on (MM/DD/YYYY) 10/28/1999 as United States Application Number or PCT International Application Number PCT/DE99/03438 and was amended on (MM/DD/YYYY) _____ (if applicable).

☐ I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

☐ I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
198 49 696.6	Fed. Rep. of Germany	10/28/1998	☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

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☐ Additional inventors are being named on the ____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

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ADDITIONAL INVENTOR(S) Supplemental Sheet
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